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THE OHIO AGRICULTURAL EXPERIMENT STATION.

Second annual report of the Ohio agricultural experiment-station, for 1883. Printed by order of the state legislature. Columbus, *Myers brothers*, state printers, 1884. 207 p. 8°.

THE first impression made by this report is that of unusual industry in experimentation. A large amount of work has been done upon wheat and Indian corn, as was natural, considering the location of the station. Quite extensive feeding-experiments have been executed; and a number of minor subjects have received more or less attention, such as observations on garden-vegetables, fruits, weeds, and injurious insects, the testing of over five hundred samples of seeds as to their germinative power, experiments on cutting potatoes for seed, etc.

Over forty pages are devoted to experiments upon wheat, and nearly as many to those upon Indian corn; such subjects being considered as the comparative value of varieties, thick and thin seeding, winter protection and spring cultivation of wheat, planting at different depths for corn, methods of culture, application of fertilizers, etc. Some interesting experiments in crossing different varieties of corn are also in progress.

The feeding-experiments relate mainly to milk-production, though a few pig-feeding trials are added; showing that the same amount of food produces more rapid growth when the animals are protected from extreme cold, — a fact which has already been proved so often, and which is so fully in accord with all that we know of the effects of a low temperature on animals, that it would seem that it might now be accepted as established.

The experiments presented in this report are so good, and represent so much labor, that one can but regret that they are not better. For example: the field-experiments on wheat and corn give evidence of care in planning and in execution. They take up important subjects, and present much food for reflection to farmers; but in all candor it must be said that they *prove* nothing. Passing over the question which is now being seriously asked by eminent authorities, whether field-trials are capable of yielding trustworthy results, it is certain, that, in order that they may do so, they must be executed with all the precautions which the experience of thirty years has suggested. It is not too much to say that these experiments are not thus distinguished, though they do, indeed, compare favorably with many others; and when we find, for example, the two unmanured plots of one series yielding respectively 40.2 and 70.4 bushels of corn per acre, we must conclude that the results of such trials are to be taken with some grains of allowance. The feeding-trials, too, while in many respects carefully conducted, have just enough elements of uncertainty — short periods, estimates of amount of hay eaten, estimates of composition of food, etc. — to give rise to the constant feeling that the results may be accidental.

It is, of course, to be presumed that this station, like most others, has not the means to do all that its director would be glad to do; and a fair criticism should take into account the limitations under which such work must usually be done. At the same time, certain conditions are essential to the prosecution of scientific research; and experiments made in disregard of them are no better because that disregard is enforced.

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.

PROCEEDINGS OF THE SECTION OF GEOGRAPHY.

THE meetings of the section were held in the Montreuil gymnasium, which was sometimes crowded to overflowing, especially upon the appearance of Lieuts. Greely and Ray.

The president's address was listened to with marked attention. After the usual formalities were passed, the proceedings were opened by the president, who communicated a letter which he had received from Mr. Joseph Thomson, — recently returned from Africa, — from which the following is extracted: "I shall have to tell about snow-clad mountains, grassy plateaux, and sterile plains, of picturesque isolated moun-

tains, wonderfully preserved volcanic cones and craters in which the fiery forces might have been at work the previous year, of the charming crater-lake Chala on the slopes of Kilima-njaro, the silvery sheets of Nainashana, Mtakuto, and Baringo, lying embosomed in a great valley-like depression formed by the dark and frowning mountains of Man and Lykipia. Not the least interesting subject will be that of the enormous volcanic mountains El Gon or Ligonyi.

"The people themselves are more interesting and unique than their country. The Masai are in every respect a people by themselves. They have no resemblance either to the true negroes or to the Galla and Somal who shut them in. They distinctly differ in their mode of life, their curious customs, forms

of government, and religious belief, not to speak of their curious language. I am happy to say that I have been able to determine the latitude of all points of interest by astronomical observations, as well as the longitude of Baringo and Kwa-Sunda near the Nyanza. The height of all main points has been determined by George's barometer.

"My route was from Baringo to near the Nile, almost due west, returning somewhat farther north. Kavisondo does not extend so far south, not more than 20' south. The north-east corner of the lake, as represented on the maps, must be cut off if my observations are correct." A spirited discussion ensued, in the course of which it appeared that Mr. Thomson had had some hairbreadth escapes, and had endured the extremity of hunger. Professor Ravenstein gave a description of the physical conformation of equatorial Africa, and said that the Masai were no new race, but had been met with before. He instanced the Latooka of Sir Samuel Baker, and M'tésa, the chief of Uganda, and quondam convert of Stanley, as belonging to the same group.

The president made a communication with regard to Mr. H. H. Johnson's Kilima-njaro expedition, to the effect that he had been well received by the ruler of the district, 'King Mandalla,' and had been given every facility for the prosecution of his work of collecting specimens of natural history.

Prof. E. G. Ravenstein, the recorder of the section, read an exceedingly interesting paper on certain maps and globes of Central Africa before the seventeenth century, which exhibited a complicated river system and a congerie of lakes. It had been supposed by certain geographers of eminence, including Mr. Major, that the hydrographical features were derived from actual knowledge obtained by the Portuguese, who had thus anticipated Livingstone, Cameron, and Stanley by a couple of centuries. But this was not a correct idea; as the learned Ludolfus—if he had carried out his intention of compiling a map of the whole of Africa—would have shown, and would thus have gained a place among cartographers second only to Delisle and D'Anville.

In order to judge how far these ancient maps were based upon actual knowledge, or were merely conjectural, it would be necessary to examine the records of early exploration; and, fortunately, we are now in a position to do this, as Luciano Cordeiro had brought to light several of the most ancient Portuguese records.

After a concise account of the explorations of the ancients, Mr. Ravenstein narrated, at some length, the exploration carried on by the Portuguese. He said that their knowledge of the coast districts was pretty full; and as early as the sixteenth century they had heard of the Makoko, the great chief of the Anteke, as well as of several tribes on the middle Kongo, of the Zambeze as far as Chicova, and of a considerable portion of Abyssinia. Inland lakes were mentioned by them, but in so vague a way that their identification with our modern lakes was impossible. Even the Nyassa seems to have been unknown

to them, although merchants from Sena navigated the Shiré; and an overland trade was undoubtedly carried on by the natives, for articles of Portuguese manufacture actually reached Manica overland from Loanda. But no Portuguese had ever crossed the continent; as Gregorio Quadra and Balthazar Rebello de Aragão, who attempted to do so in 1520 and 1602, had failed at the very outset.

With regard to the ancient maps, he stated that the earliest among them were mere repetitions—so far as the interior was concerned—of Ptolemy. Later on, the remarkable information given by Fra Mauro on Abyssinia was embodied in them. Ruysch's map (1508) is an illustration of Ptolemy; and if we took the more detailed maps of the period,—Pigafetta, illustrative of the 'Congo,' for instance,—and transferred the names there found to their correct position, we should find that the interior of Africa was a blank. As an example, Barcena, Coloes (from Ptolemy), Zahaf, and Saphat were names all referring to the great lake of Abyssinia, our Lake Tsana.

It followed from this, that, up to the beginning of the seventeenth century, the Portuguese had no knowledge of the centre of Africa and of its great river-systems; although subsequently they had made certain discoveries which anticipated, in a measure, the information obtained by the heroes of modern African exploration.

Mr. Trelawney Saunders described the remarkable journey of a trained native of India—Krishna, or A. K., as he is more commonly called—who penetrated regions hitherto known to us only through D'Anville's *Atlas de la Chine*, which contains maps of Tibet, derived from the surveys of Lama priests, made in continuation of the great Jesuit work, under the orders of the famous emperor Kuenten. It has been all along a most interesting feature of the researches of the native explorers in Tibet, that they have, in a remarkable degree, confirmed these Tibetan surveys, allowing some little differences easily recognized. In the present case the explorer, leaving Prjevalski's route at a point near the source of the Hoangho, struck a river, which, on placing a reduction of his work upon a reduction of the Lama survey, on the same projection and scale, falls exactly, without any exaggeration, upon the course of the Murus Ussu, or upper waters of the great river Yang-tse-Kiang. Nevertheless, the conclusions adopted in Calcutta make this river to be the Yalung, one of the great affluents of the Yang-tse-Kiang.

After some little discussion of a rather desultory nature,—in the course of which Mr. Gordon, an engineer who has travelled extensively in India, asserted that the country on the Bacco, where about six hundred inches of rain fall in a year, was the rainiest in the world,—Mr. Saunders described the first general census of India, which was taken on Feb. 17, 1881. The entire population enumerated was 253,891,821, occupying an area of 1,382,624 square miles. He then compared various parts of this large population with that of other countries chiefly European, and described the Indian house and its contents. This census, which is embodied in twenty folio volumes,

contains reports under the following heads: area of population; movement of population; religious classification; proportion of sexes and religious divisions; condition of population; condition and age of population by religion and province; birthplaces, insanity, deaf-mutes, occupations, languages, education, blind people, lepers, castes. The reports in general are not merely a dry record of figures; but they abound with information of a most interesting character, concerning this grand division of the population of the world, which stands second only in number to its still vaster neighbor, the empire of China. It may be useful to add that an abstract of this census may be obtained in three volumes.

The president of the section, Sir J. Henry Lefroy, spoke of the value of the census, and enlarged upon the fact that it showed that there were nearly two million native Christians in India. In answer to a question, Mr. Saunders said that of this large population but 89,000 were natives of the United Kingdom.

The next paper was on Mount Roraima in British Guiana, by Mr. E. F. im Thurn, for some time a magistrate there, who proposes to examine the mountain as closely as possible on every side, and to make the ascent, should circumstances permit. He intends, moreover, to examine and collect the flora and fauna of the country, and especially to investigate the condition of the little-known Arecoona Indians in whose district Roraima lies.

In conclusion, the recorder of the section, Prof. E. G. Ravenstein, read an exceedingly suggestive paper on the proper method of teaching young children the rudiments of geography. He said that the time when teachers of geography confined themselves to teaching their pupils a barren list of localities was fortunately past, and the principles first enunciated by Pestalozzi and Fröbel might be said to have taken a fair hold. But still the geographical text-books were far too abundant in nomenclature, as distinct from an exposition of facts or an explanation of phenomena. Elementary geography should teach our children to understand the locality in which they live, to observe, and to think for themselves, instead of accepting the definitions presented to them; to describe, further, their experiences in language of their own, instead of paraphrasing the language made use of by their teachers. This method compelled us to take our children out of the school-room, and to bring them to the locality which it was desirable to describe. The lesson which followed would be really an object-lesson, which lessons based on a map or a picture or a model could not be. The children should be encouraged to observe the same phenomenon repeatedly until they have obtained a clear conception of it. The children would then observe the fact under consideration once more, with such help as would be afforded by the teacher's explanation; and to this would succeed a final consideration of the subject, within the schoolroom. The subjects of this elementary study ought to include the surface features of our earth, its vegetation and fauna, and its inhabitants. Atmospheric phenomena, as well as the celestial bodies, in as far

as their movements are visible from our earth, should also be included. He would include the elements of geology and of natural science generally, in so far as they would explain geographical phenomena; and, besides, he would seek an opportunity of expounding the principles of political economy and of statistics. The range was, therefore, a wide one. The subjects would differ according to the locality in which the school was placed, as during the earlier stages the children would be limited to subjects coming within their sphere of observation; and only at a more advanced age, when the power of imagination had been developed, would they carry the young mind from things seen to things unseen. Thus a consideration of the St. Lawrence and its turgid tributary, the Ottawa, would carry them in course of time to the great lakes, and to the magnificent forests, which explain the color of the water of the rivers. The various phenomena would not at first be considered systematically, but as occasion arose.

This paper was followed by an interesting discussion; during which it was remarked, that the main difficulty in introducing such a method into the school boards of England was the examination system there in vogue; as it was necessary for teachers, if they wished to retain their places, to cram their pupils for the examination. May not some such vicious system be the cause of the gross ignorance on geographical subjects which prevails in our own country?

Mr. James Glaisher read a report of the committee for promoting the survey of western Palestine. He first gave a brief history of the 'Palestine exploration fund,' which was founded in 1865 with the object in general terms of obtaining from the Holy Land itself whatever facts might be gathered for the elucidation of the Bible. The work was classified as follows: 1. Archeology—including excavations; 2. Manners and customs of the modern inhabitants; 3. Topography; 4. Geology; 5. Natural sciences, botany, zoölogy, etc.

The first work undertaken was the excavation at Jerusalem, which occupied the years 1867-1870, and threw a flood of light upon the ancient city. In 1870-1871 a journey was made through the Desert of the exodus; and in the autumn of 1871 the survey, on the scale of an inch to a mile, of western Palestine, was begun. The work was carried on until 1875, when the party was attacked by the Arabs. In 1877 it was resumed; and in 1880 a map in twenty-six sheets was published, followed by a reduction of it on one-third scale in 1882.

In 1882 the survey was extended to the east of the Jordan, but owing to the opposition of the natives was abandoned after only about five hundred square miles had been surveyed. The society is now waiting for the Sultan's firman, without which Mr. Glaisher stated no alien is allowed to remain more than one month in the country, to go there with a camera, or to take away the smallest specimen. He then gave a short account of the results of the geological survey conducted by Professor Hull last winter, a full account of which is now in press.

Dr. J. B. Hurlbert said that by comparing the climates of different portions of the two hemispheres, — western coasts with western, eastern with eastern, and interior divisions with interior, — it was found that vast areas in the new world possessed soils and climates similar to corresponding regions of the old. With regard to the coasts, this was due to the oceanic currents. As to interiors, they had warmer summers and colder winters than oceanic regions; and in the central part of North America, between the parallels of 30° and 50° north latitude, there was but little rain in summer, and much snow in winter. This summer drought was due not to the Rocky Mountains, as many had supposed, but to the prevalence of southwest winds. The operation of these winds was described in detail, and it was asserted that trees could not be induced to grow in that arid waste, and that the prairie once broken up could not be reset. The reverse of all this was true of the interior of Canada. He closed by remarking that climates have as powerful an effect upon the human race as upon vegetables; and that, therefore, the people of this region of great summer drought would in time become like the Bedouin Arabs; while Canada would be the future great power on the continent.

Dr. Hurlbert then read a paper on some peculiar storms. He began by saying that he did not believe in the existence of cyclones, although he admitted the existence of whirlwinds in the West Indies. But he thought that the hurricanes which swept our eastern coasts were due to a warm current of air, which, starting from the Gulf of Mexico, proceeded in a northerly and easterly direction, and, meeting with a cold atmosphere, condensed. Into the vacuum thus formed, air poured from every side, and the storm swept on with ever-increasing violence.

Dr. Ball said that he thought that Dr. Asa Gray would hardly agree with the learned gentleman's deductions with regard to the future of vegetation in the region of summer drought, and reminded him that it often rained there when least expected, and hinted that averages of rainfall, etc., were likely to be misleading. He also asked him some questions as to the climate of the coast of California, to which no satisfactory explanation could be given.

Mr. Trelawney Saunders then severely criticised the unscientific method pursued by the Dominion survey, borrowed from that of the United States survey, which had been devised in times of geodetic darkness; and he advised a method of division of the land by meridians and parallels, which was shown (the next day) by Mr. Leslie Russell of the Dominion survey to be precisely the method pursued by that survey. As to Mr. Saunders's criticisms on the lack of orographic information furnished by the maps of the survey, Mr. Russell replied that the differences in elevation were so slight in the region now being surveyed, that it was impossible to show them by any ordinary means; and that, besides, it was necessary that the territory should be laid out into sections, townships, etc., as soon as possible, that settlers might go there and take up land without fear of future litigation as to boundaries and titles.

On the fourth day Lieut. P. H. Ray, U.S.A., after describing the objects of the circumpolar expeditions, gave an account of the explorations and observations undertaken by him at Point Barrow, Alaska. He said that the ground never thawed to a greater depth than twelve inches; and that two years' careful observation had satisfied him that there is no open polar sea, from the fact that the temperature of the sea-water is unvarying from the time the sea closes in October until it opens in July, which could not well be the case if there were a large body of warm water lying around the pole. Besides, the atmospheric conditions were found to be such as would not exist near a large body of open water. In addition, all discoverers had noticed, that, although a current runs to the north, nevertheless the sea is filled with old ice, which he thought came from the north, and this could not happen if there is an open polar sea. In concluding he said, that, in laying out the work for the circumpolar expeditions, the magnetic pole had been neglected, which was a great mistake; and he declared that he would willingly go there himself.

The president of the section, in introducing Lieut. Greely, said that his party had helped to solve one of the most difficult geographical problems of the day, and that Lieut. Lockwood had reached the farthest north; that they had furnished data for determining the compression of the polar axis, by observations nearer the pole than any hitherto made; and that they had brought home the pendulum used, that it might be corrected at Washington. He thought that nothing in the annals of scientific heroism exceeded the devotion of those hungry men in sticking to that ponderous piece of metal. Lieut. Greely's paper descriptive of the work of the expedition has been extensively printed; and there is no need of mentioning here more than a few points which, indeed, were supplementary to the paper itself. He said that at Fort Conger the ground thawed to a much greater depth than at Point Barrow, namely, between twenty-nine and thirty-four inches; and that with regard to an open polar sea he believed in the existence of an open, but not necessarily navigable, sea in that direction. He said that he had only been at his station a short time when it struck him that he could tell whether the tide was flowing or ebbing, by the temperature of the water; and by observations he found that when the tide came from the north the water was warmer than when it came from the south. The tide travelled with great velocity; and most perfect observations had been made at different points, in many cases simultaneously, which would be published in due season.

Capt. Bedford Pim, in offering his congratulations to the explorers upon their safe return, said that he was glad that Lieut. Greely agreed with him as to the existence of a *polynia* in the vicinity of the pole, and he hoped that Lieut. Ray would be brought to their way of thinking.

It seemed to be the opinion of all the speakers, that arctic exploration should be continued, and that it was especially important that the magnetic pole (of

which Capt. Pim declared no one knows the position) should be visited, and a large number of accurate observations there taken.

A lunch was given to the two lieutenants in the afternoon, but nothing was then said of geographical importance.

Mr. R. G. Haliburton said that he considered the saga of Eric the Red, describing the voyage of his son Leif to Vinland, a poetic version of Bjarne's voyage reversed. Eric, driven from Norway, and afterwards from Iceland, discovered a dreary country, which he called Greenland, avowedly to attract emigrants thither. Subsequently the land sighted by Bjarne, and visited and colonized by Eric's family, was called by them, evidently for the same object, *Vinland the Good*. The length of the shortest day, the presence of Eskimos, the Norse maps, and geographical notices, all show that Vinland could not have been south of the north-western part of Newfoundland.

Mr. Haliburton also said that recently discovered Portuguese documents prove that the next oldest colony in America was *Terra nova*, embracing Labrador, Newfoundland, and Nova Scotia, which was explored by the Corte Reals in 1500-1502; and that commissions were regularly issued to them as governors up to 1579. In 1521 a patent was issued to Fagundes of all the lands between the Spanish colonies and 'the land of the Corte Reals.' He had recently discovered, while in the Azores, that two Portuguese colonies sailed thence to Cape Breton in 1521 and 1567, probably to St. Peters and Ingonische. The Spaniards, who annexed Portugal to Spain in 1580, sent a colony to Spanish Harbour (Sydney) between 1580 and 1597. He added that Cape Race (*Cabo raso* — 'bare cape'), the Bay of Fundy (*Fonda* — 'deep'), and other Portuguese names, still tell of this 'lost colony.'

The Rev. Abbé Laflamme then said, that the province of Quebec may be divided into two hydrographic basins, — that of the St. Lawrence, and that formed by the collection of lakes which fed the rivers flowing into Hudson's Bay. The name of only one of these lakes was known, — lake Mistassimi. It was certain, however, that there were many others of great size in its vicinity and on the peninsula of Labrador. He declared that all the maps hitherto published of lake Mistassimi were inexact. One thing only was certain, and that was, that it was larger than lake Ontario.

Professor W. Boyd Dawkins maintained that the former connection of North America with Greenland, Iceland, and north-western Europe is most conclusively proved by the distribution of the fossil plants and animals in the eocene and miocene ages. The tract of comparatively shallow water ranging from Greenland past Iceland to the Faroës and northern Scotland, and which isolates the deep waters of the Arctic sea from the depths of the Atlantic, formed the bridge across which the migration took place, the four-hundred-fathom line representing approximately the line of the ancient shores. The barrier became submerged towards the close of the miocene age;

and then, for the first time, the Arctic waters united with the Atlantic, and arctic shells gradually found their way southwards into the area of the British isles.

Mr. J. S. O'Halloran then presented a memorandum with regard to Winnecke's exploration of central Australia, with notes on the employment of camels, and some extracts from his journals. The reference to camels reminded Mr. Torrance that they were formerly employed in British Columbia, but that the smell of the beasts so terrified horses that the government ordered their use to be discontinued.

The president of the section then made some remarks about the poor attendance at some of the meetings, — at one time there were but four persons present, besides the officers and reporters, — which he attributed to the unfortunate position of the building in which the meetings were held; and the section was then adjourned.

PROCEEDINGS OF THE SECTION OF ECONOMIC SCIENCE AND STATISTICS.

THIS section has been in existence almost from the foundation of the British association, having been organized as a section of statistics in 1833: economics were added in 1856. The range of topics considered has been very wide, and has included such topics as population, mortality, emigration, labor, crime, punishments, debt, wealth, trade, coinage, banking, insurance, poor-laws, schools, libraries, sanitary regulations, water-supply, pollutions of rivers, forestry, agriculture, stock-raising, imports and exports.

The section assembled at eleven o'clock on Thursday, in Synod hall, several blocks distant from McGill college, where most of the sections were located. Nevertheless, about 140 persons were present to listen to the address of the sectional president, Sir Richard Temple, of London, upon the general statistics of the British empire.¹ It was noticeable that the applause occurred when reference was made to the superiority of Great Britain, and but once when comparisons showed the United States to be superior to the empire. A vote of thanks was proposed by Prof. J. Clark Murray, of Montreal, and was supported by Mr. Edward Atkinson of Boston, who highly complimented Sir Richard Temple for his efforts in founding the school of British economical science. Professor Murray thought this section would be more interesting to Canada than any other; because, 1° it was not so abstruse, and 2° it treated of matters of vital importance to Canadian voters. He hoped soon to see a chair of economic science in McGill college.

Sir Richard Temple said he would accord the place of honor to the United States, and called on Mr. Atkinson to read the first paper, entitled 'What makes the rate of wages.' Mr. Atkinson said that the argument of Mr. Henry George in his 'Progress and poverty,' that the rich are growing richer, and the poor

¹ The address is printed in abstract in *Science* of Sept. 5, p. 214.